

TheaterSync™



NEC *TheaterSync* Video Processor

User Manual

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1 Preface

1.1 Limited Warranty

NEC Solutions (America), Inc. warrants this product to be free from defects in material and workmanship under the following terms and, subject to the conditions set forth below, agrees to repair or replace (at NEC Solutions' sole option) any part of the enclosed unit which proves defective. Replacement parts or products may be new or refurbished and will meet specifications of the original parts or products.

HOW LONG IS THE WARRANTY?

Parts and labor are warranted for (1) one year from the date of the first customer purchase.

WHO IS PROTECTED?

This warranty may be enforced only by the first purchaser.

WHAT IS COVERED AND WHAT IS NOT COVERED

Except as specified below, this warranty covers all defects in material or workmanship in this product. The following are not covered by the warranty:

1. Any product which is not distributed in the U.S.A. or Canada by NEC Solutions or which is not purchased in the U.S.A. or Canada from an authorized NEC Solutions dealer.
2. Any product of which the serial number has been defaced, modified, or removed.
3. Damage, deterioration or malfunction resulting from:
 - a. Accident, misuse, abuse, neglect, fire, water, lightning or other acts of nature, unauthorized product modification, or failure to follow instructions supplied with the product.
 - b. Repair or attempted repair by anyone not authorized by NEC Solutions.
 - c. Any shipment of the product (claims must be presented to the carrier).
 - d. Removal or installation of the product.
 - e. Any other cause which does not relate to a product defect.
 - f. Burns or residual images upon the phosphor of the panel.
4. Cartons, carrying cases, batteries, external cabinets, magnetic tapes, or any accessories used in connection with the product.
5. Service outside of the U.S.A. and Canada.

WHAT WE WILL PAY FOR AND WHAT WE WILL NOT PAY FOR

We will pay labor and material expenses for covered items, but we will not pay for the following:

1. Removal or installation charges.
2. Costs of initial technical adjustments (set-up), including adjustment of user controls. These costs are the responsibility of the NEC Solutions dealer from whom the product was purchased.
3. Shipping charges.

HOW YOU CAN GET WARRANTY SERVICE

1. To obtain service on your product, consult the dealer from whom you purchased the product.
2. Whenever warranty service is required, the original dated invoice (or a copy) must be presented as proof of warranty coverage.
When mailing the request for service, always include your name, address, and a description of the problem(s).
3. For the name of the nearest NEC Solutions authorized service center, call NEC Solutions at 800-836-0655.

LIMITATIONS OF LIABILITY

Except for the obligations specifically set forth in this warranty statement, we will not be liable for any direct, indirect, special, incidental, consequential, or other types of damages, whether based on contract, tort, or any other legal theory, whether or not we have been advised of the possibility of such damages. This warranty is in lieu of all other warranties expressed or implied, including, but not limited to, the implied warranties of merchantability or fitness for a particular purpose.

EXCLUSION OF DAMAGES

NEC Solutions' liability for any defective product is limited to the repair or replacement of the product at our option. NEC Solutions shall not be liable for:

1. Damage to other property caused by any defects in this product, damages based upon inconvenience, loss of use of the product, loss of time, commercial loss; or
2. Any other damages whether incidental, consequential or otherwise. Some states do not allow limitation on how long an implied warranty lasts and/or do not allow the exclusion or limitation of incidental or consequential damages, so the above limitations and exclusions may not apply to you.

HOW STATE LAW RELATES TO THE WARRANTY

This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

FOR MORE INFORMATION,
TELEPHONE 800-836-0655
NEC SOLUTIONS (AMERICA), INC.
1250 N. Arlington Heights Road, Suite 500
Itasca, Illinois 60143-1248

Note: *All products returned to NEC Solutions (America), Inc. for service MUST have prior approval. To get approval, call NEC Solutions (America), Inc. at 800-836-0655.*

1.2 Related Documents

- *TheaterSync Service Manual*

1.3 FCC Statement

Note: This equipment has been tested and found to comply with the limits for Class B digital devices, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential/office installation. The equipment generates uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced Radio/TV technician for help.
- Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

1.4 Safety

1.4.1 Important Safety Instructions



This symbol warns the user of uninsulated voltage within the unit that can cause dangerous electric shocks.

TO REDUCE THE RISK OF FIRE OR ELECTRIC SHOCK, DO NOT REMOVE COVER. NO USER SERVICEABLE PARTS INSIDE. REFER SERVICING TO QUALIFIED SERVICE PERSONNEL.

TO REDUCE THE RISK OF FIRE OR ELECTRIC SHOCK, DO NOT EXPOSE THIS APPLIANCE TO RAIN OR MOISTURE.



This symbol alerts the user that there are important operating and maintenance instructions in the literature accompanying this unit.

Read the User Guide carefully and completely before operating the unit. Be sure to keep the User Guide in a near-at-hand location for future reference. Strictly follow all warnings and cautions in this User Guide, as well as the following safety suggestions. To prevent electric shock or injury, follow these safety instructions in the installation, use, and servicing the unit.

1.4.2 Installation

Attachments - Do not use attachments not recommended by the manufacturer, as they may result in the risk of fire, electric shock, or injury to persons.

Water and Moisture - Do not use this unit near water; for example, near a bathtub, washbasin, kitchen sink or laundry tub, in a wet basement, or near a swimming pool, water spa, or the like.

Heat - Do not use this unit near sources of heat, including heating vents, stoves, or other appliances that generate heat. Also, do not place this product in temperature environments greater than 45°C (104°F).

Mounting Surface - If not installing the unit in a standard equipment rack using the recommended mounting brackets, place the unit on a flat, even surface. Do not place the unit on an unstable cart, stand, tripod, bracket, or table. The unit may fall causing serious injury to a person and/or serious damage to the appliance.

Portable Cart - An appliance and cart combination should be moved with extreme care. Quick stops, excessive force, and uneven surfaces may cause the appliance and cart combination to overturn.

Ventilation - Locate the unit with adequate space around it so that proper heat ventilation is assured. Allow 10 cm (4 in) clearance from the rear and top of the unit, and 5 cm (2 in) from each side.

Slots and openings in the unit's case are provided for ventilation to ensure reliable operation of the unit and to prevent overheating. These openings must not be blocked or covered. The openings should never be blocked by operating the unit while placed on a bed, sofa, rug, or similar surface. This unit should not be placed in a built-in installation such as a bookcase unless adequate ventilation is provided.

Entry of Foreign Objects and Liquids - Never push foreign objects of any kind into this unit through the ventilation slots as they may touch dangerous voltage points or short-circuit electrical/electronic parts that could result in fire, or electric shock, or both. Never spill liquid of any kind onto the unit.

Electric Power - Only operate the unit from the type of electric power source indicated on the unit's labeling. If you are not sure of the type of power supply that is available in your home or workplace, consult your appliance supplier or local power company.

Grounding or Polarization - This unit is provided with a 3-pin, grounded, alternating current line plug. This plug will fit into the power outlet only one way. This is a safety feature. Do not try to defeat the safety purpose of the plug.

Power Cord Protection - Route power supply cords so that they are not likely to be walked on or pinched by placing items upon or against them, paying particular attention to cords at plugs, convenience receptacles, and the point where they exit from the product.

Overloading - Do not overload wall power outlets, extension cords, or integral convenience receptacles as this can result in a risk of fire or electric shock.

Lightning - For added protection for this unit during a lightning storm, or when it is left unattended and unused for long periods of time, unplug it from the power outlet. This will prevent damage to the unit due to lightning or power surges.

1.4.3 Maintenance

Cleaning - Unplug this unit from the wall outlet before cleaning. Do not use liquid cleaners or aerosol cleaners. Only use a soft cloth dampened with a mild detergent solution. Do not use strong solvents such as alcohol, benzene, or paint thinner.

Damage Requiring Service - Unplug this unit from the power outlet and refer servicing to qualified service personnel under the following conditions:

- When the power cord or plug is damaged.

- If liquid has been spilled or foreign objects have fallen into the unit.
- If the unit has been exposed to rain or water.
- If the unit does not operate normally, following the operating instructions. Adjust only those controls that are covered by the operating instructions as improper adjustment of other controls may result in damage and may require extensive work by a qualified technician to restore the unit to normal operation.
- If the unit has been dropped or the case has been damaged.
- When the unit exhibits a distinct change in performance - this indicates a need for service.

Do not attempt to service this unit yourself as opening or removing covers may expose you to dangerous voltage or other hazards. Refer all servicing to qualified service personnel.

2 Introduction

2.1 General Description

The NEC *TheaterSync* (see **Figure 1**) is a high performance video signal processor intended as a companion for plasma and projector displays. *TheaterSync* brings the power of Silicon Optix HQV™ (“Hollywood Quality Video”™) technology to viewers of plasma and projector displays. Initially conceived in the military research labs of Lockheed Martin and then refined and commercialized by Teranex and Silicon Optix, HQV video processing has been the technology of choice of film and video professionals in broadcast and studio environments for years. A breakthrough in cost reduction and packaging now enables this revolutionary technology - previously found only in Professional Post Production, Film Editing and Broadcast Studios – to be delivered to your home or business viewing environment.



Figure 1: NEC *TheaterSync* Video Processor

As a video signal processor, *TheaterSync* receives the video signals generated by a wide variety of consumer electronic and professional devices, switches between them, and applies HQV signal processing to the selected signal (see **Figure 2**). The processed signal is then scaled to the appropriate resolution and aspect ratio of the plasma panel, projector, or other display device. HQV signal processing includes the following powerful features:

- State-of-the-art, motion-adaptive de-interlacing for both SDTV and HDTV
- Temporal Recursive Noise Reduction
- Codec Noise Reduction (includes mosquito noise reduction and block artifact removal)
- Detail Enhancement
- Fully-automatic detection and correction for multiple film/video cadences (3:2, 2:2, variable, 6:4, 8:7, etc.)
- AnyPlace™ technology for extreme off-axis keystone correction
- Brightness-Contrast Enhancement
- Color Space Conversion and Color Temperature Adjustment

For more information on HQV technology, visit <http://www.hqv.com>.

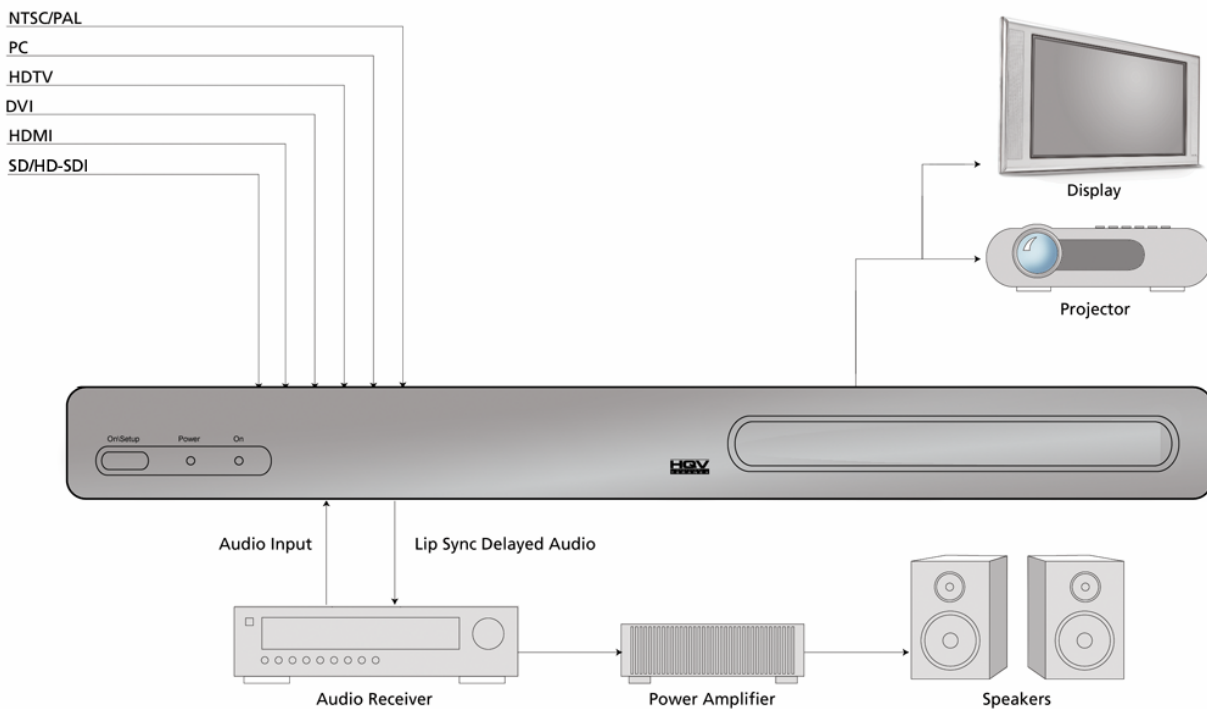


Figure 2: Typical *TheaterSync* Application

TheaterSync also performs a number of useful signal processing functions such as high-quality video scaling, switching, extreme keystone correction and audio delay, thus eliminating the requirement for stand-alone scalers or audio delay units within your system.

TheaterSync offers access to a truly wide range of signal inputs – everything from SDTV (composite, S-Video and component) to HD-SDI and all popular video and computer graphics signals in between (including analog RGB, DVI, and HDMI) may be selected as inputs.

TheaterSync provides video output in HDMI, DVI and analog RGB formats on dedicated connectors.

All this functionality can be controlled through a simple 20-button IR remote control unit (see **Figure 5**). Simple navigation keys bring access to a simple, yet elegant OSM (On-Screen Menu). Video input device selection is accomplished using dedicated IR remote buttons. Access to the HQV features is also provided through dedicated IR remote buttons. Also, *TheaterSync* provides the professional user with flexible control methodologies of RS-232, USB and Ethernet. For details on the control programming protocol, refer to the *TheaterSync Service Manual*.

The *TheaterSync* video processor is available in a compact and attractive desktop package that can be rapidly fitted to a standard 19" rack using a rack mounting kit (included).

Features and Specifications

Input Video Signals

- Composite Video (NTSC, PAL and SECAM)
- S-Video (NTSC and PAL)
- Component (YPbPr for SDTV and HDTV in American and European formats)
- Analog RGB (VGA to SXGA60Hz)
- DVI (VGA to QXGA)
- HDMI
- SDI (including HD-SDI and audio)

Output Video Signals

- Analog RGB (VGA to UXGA)
- DVI (VGA to QXGA)
- HDMI

Input Audio Signals

- S/PDIF
- Toslink
- HDMI

Output Audio Signals

- S/PDIF
- Toslink
- HDMI

Video and Audio Processing Capability

- Scaling
- Extreme Keystone Correction (+/- 40° horizontal, +/- 30° vertical)
- Audio Delay
- Input Switching
- Aspect Ratio Correction
- HQV Video Processing ...
 - Temporal-Recursive Noise Reduction
 - Codec Noise Reduction
 - Fully-automatic cadence detection and correction
 - Detail Enhancement
 - Advanced motion-adaptive de-interlacing

Control

- IR Remote Control
- RS-232
- USB (for connection to Crestron / AMX boxes)
- Ethernet

Physical Characteristics

Dimensions: 17.0" x 9.7" x 1.75" (43.2 x 24.6 x 4.4 cm)
Weight: 7 lbs. (3.2 kg)
Power: 100-240V, 47-63 Hz, 72W

Panel Diagrams



Figure 3: TheaterSync Front Panel Drawing

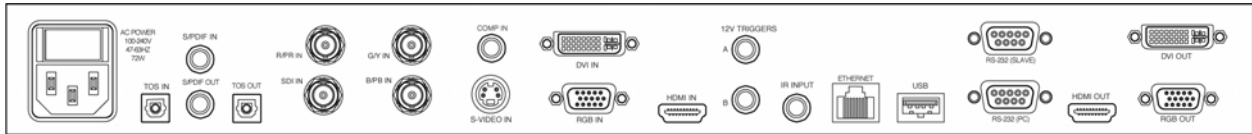


Figure 4: TheaterSync Rear Panel Drawing

3 Installation

3.1 List of Standard Components

The *TheaterSync* processor ships with a number of standard components. When unpacking your unit, verify that the following items are included:

- *TheaterSync* unit (qty 1)
- IEC-320 American AC power cord (qty 1)
- Infrared remote control (qty 1)
- Rack-mount adapter kit (qty 1)
- *TheaterSync User Manual* (qty 1)

3.2 Setting up your TheaterSync

To set up your *TheaterSync* unit, follow the steps below:

1. Connect the *TheaterSync* unit to the video input sources.
2. Connect the *TheaterSync* unit to the display device.

NOTE: If you are connecting to a panel or projector that supports the coding of HDCP encrypted material on its DVI input, you must connect to that DVI input using TheaterSync's HDMI OUT connector (and an HDMI to DVI adapter).

3. To power up the unit, press the Power switch located on the rear of the unit, close to the power cord. The Power switch may be left on in normal operation. The On/Setup button on the front panel may be used to put the unit into a low-power state (Setup Mode).

NOTE: When TheaterSync is in Setup (Stand-by) Mode, the output to the projector or panel is temporarily suspended.

4. Select the output resolution to match the native resolution of the display device:
 - a) Place the unit in Setup (Stand-by) Mode by toggling the Operate/Setup button on the IR remote (or by using the On/Setup button on the unit's front panel).
 - b) Using the up/down arrow keys of the remote, cycle through the different setup modes (which will be displayed on the box LCD display) until the output resolution mode is selected ("OUT = xxx" will appear on the LCD display, where 'xxx' is the current active output resolution)
 - c) Using the left/right arrow keys, select the desired output resolution.
5. Return TheaterSync to Operate Mode by pushing the **On/Setup** button on the front panel or the **Power** button on the IR Remote. This activates the TheaterSync output circuits. Further adjustments may be made using the TheaterSync OSM (On-Screen Menu).

For projection applications where keystone correction is required, continue with the following steps:

6. If the projector has an AUTOSET or AUTODETECT feature, disable this function. These projector modes may cause image distortion if a keystone-corrected image is applied to the projector input.
7. Select the “Advanced” menu from the *TheaterSync* OSM, then select “Projection”, and “Horizontal and Vertical Keystone” submenus.
8. Using the up/down arrow keys, select in turn each of the image corner sliders and then use the left/right arrow keys to move the corner to the desired location on the screen. Continue adjustments until the projected image matches the target screen geometry.

4 TheaterSync User Interface

4.1 IR Remote Control

All *TheaterSync* user interface controls are accessed via infrared (IR) remote control. The remote has three groups of controls:

- a) OSM Navigation (including the Operate/Setup Key),
- b) Video Source Selection, and
- c) HQV Feature Selection.

You may also select video sources and HQV processing features through the OSM navigation controls, however dedicated IR remote keys provide you with quick one-touch access to the most frequently used commands. **Figure 5** illustrates the *TheaterSync* remote control.



Figure 5: *TheaterSync* Remote Control

A description of the various buttons and their functions is as follows:

The **Operate/Setup** button toggles the *TheaterSync* between “Operate” and “Setup” modes of operation (as described in the next section of this User Interface chapter).

The **Menu** button is used to invoke the OSM main menu.

The **Up/Down/Left/Right** Arrow buttons are used to navigate the OSM.

The **Enter/Select** button is used to activate an OSM menu selection.

Direct (one-touch) input selection is possible using the buttons below:

- The **RGB** button selects the VGA port as the active input.
- The **DVI** button selects the DVI port as the active input.
- The **Video** button selects the composite video port as the active input.
- The **S-Video** button selects the S-Video port as the active input.
- The **YPbPr** button selects component video as the active input.
- The **HDMI** button selects HDMI as the active input.
- The **SDI** button selects the SDI port as the active input

Additional buttons are available to directly access key video processing features and to cycle through the available enhancements:

- The **BCE** button activates/deactivates the Brightness / Contrast Enhancement feature
- The **Aspect Ratio** button cycles through and selects the available aspect ratio treatments available for the current input and output mode combination (for description of aspect ratio treatments, see **section 5.2**)
- The **TRNR** button accesses the Temporal Recursive Noise Reduction feature, cycling through the four available settings (Off, Low, Medium, and High)
- The **CNR** button accesses the Codec Noise Reduction feature, cycling through the four available settings (Off, Low, Medium, and High)
- The **Film** button cycles through the three available film mode treatments for active video (Auto Film/Video mode detect, Force to Video mode, Force to Film mode)
- The **Split** button activates/deactivates a split-screen mode for direct comparison of the image with and without noise reduction activated.

4.2 *TheaterSync* Operational Modes

TheaterSync has two operational modes, **Operate** and **Setup**. These modes are selected by a dedicated key on the IR remote. *TheaterSync* also enables selection of the Operate Mode with RS-232, USB, or Ethernet.

4.2.1 Operate Mode

Operate Mode is entered by toggling the **Operate/Setup** button on the IR remote. A brief transition of about 3 seconds occurs when Operate Mode is entered. During this transition period, the 24 x 2 LCD Display indicates

THEATERSYNC
Please Wait

In Operate Mode, the video output signals are activated and you may control all of *TheaterSync* parameters with the remote control (except for Setup restricted parameters, as noted below). The LCD front panel display indicates the following information in its 24 x 2 character matrix:

(Selected Input Connector) = (Input Signal Detected)
Output = (Output Resolution currently selected)

Depending on which IR remote key that you select, the operation of the OSM is slightly different.

If you select the **Menu** key, the *TheaterSync* OSM appears on the screen. Complete details on the OSM may be found in **chapter 5**. The OSM remains on the screen until you press the Menu key once again or until 30 seconds with no IR remote activity passes.

If you select one of the dedicated **HQV Feature** keys, the HQV feature is immediately activated. A brief message indicating the status of the selected HQV feature appears momentarily on the screen (e. g. TRNR = Medium or CNR = Off).

If you select one of the **Input Source** keys, the selected source is chosen as the input. The previously selected HQV Features, Aspect Ratio Treatment, Scaling and Video Parameters are all preserved for each input; each input will appear exactly as you left it.

TheaterSync powers up in Operate mode. All operational parameters are retained from the previous session. A Factory Reset returns all parameters to the default state (defaults are described in **chapter 5**), except for the input signal. The input signal most recently used is retained as the power-up input signal.

4.2.2 Setup (Stand-by) Mode

Setup mode is entered by toggling the Operate/Setup button on the IR remote.

In Setup mode *TheaterSync* is in a low-power state. The output signals are de-activated (no output will appear on your display device). Setup mode enables you to power the unit down, but still leaves the IR receiver circuitry energized so that you can re-start the system with the IR remote. When the unit is in Setup Mode, you can also make adjustments to certain sensitive

parameters, such as Output Resolution. Visual feedback for the adjustments of Setup Mode is seen on the 24 x 2 LCD display, rather than on OSM of the main screen. Sensitive parameters are placed in the Setup Menu so that an inadvertent key stroke with the IR remote does not cause a change in a parameter that would be difficult to recover from. **Table 1** lists the Setup parameters and **Table 2** lists the output resolutions currently supported in the unit.

Table 1: Setup Parameters

Parameter	Description ¹
OUT = XXX ## Hz	Cycles through all of the available <i>TheaterSync</i> output modes (see Table 2 for a list of Output Resolutions).
LCD Brightness = On (Off)	Turns On (Off) the 24 x 2 LCD Display during Operate Mode
Output Sync = Free Run (Vadjust 1:1, Vjam)	These settings enables to adjust the output sync: Free Run – Establishes a precise output timeline Vadjust 1:1 – Forces the output timeline to be frame locked to the input by inserting or deleting entire lines of output video Vjam – Maintains frame lock by truncating final line of output frame
BAUD = #####	Lets you choose a baud rate of 1200, 9600, 19200, 57600, or 115000 .
OSM Location = Input (Output)	The OSM may be located pre (Input side) or post (Output side) scaling and keystone correction
PC Control = Active (Inactive)	Turns On (Off) the computer control capability
DHCP = On (Off)	Turns on Dynamic IP Address Selection
IP=aaa.bbb.ccc.ddd	Select IP Address (selectable only if DHCP = Off)
DNS=aaa.bbb.ccc.ddd	Select DNS Address (selectable only if DHCP = Off)
2 nd DNS=aaa.bbb.ccc.ddd	Select Alternate DNS Address (selectable only if DHCP = Off)
Gateway=aaa.bbb.ccc.ddd	Select Gateway Address (selectable only if DHCP = Off)
SubMask=aaa.bbb.ccc.ddd	Select SubNet Mask (selectable only if DHCP = Off)
Serial No = #####	Indicates the Serial # of <i>TheaterSync</i> unit
MAC = ## ## ## ## ## ##	Indicates the MAC Address of <i>TheaterSync</i> unit

¹ The default parameters configurations are highlighted in bold.

Table 2: *TheaterSync* Output Modes

Output Mode	Comments
VGA 60 Hz (640 x 480)	VESA Standard
VGA 50 Hz (640 x 480)	VESA Standard
848 x 480 60 Hz	/
SVGA 60 Hz (800 x 600)	VESA Standard
SVGA 50 Hz (800 x 600)	VESA Standard
720p 60 Hz (1280 x 720)	SMPTE Standard
720p 50 Hz (1280 x 720)	SMPTE Standard
XGA 72 Hz (1024 x 768)	VESA Standard
XGA 60 Hz (1024 x 768)	VESA Standard
XGA 50 Hz (1024 x 768)	VESA Standard
1360 x 768 60 Hz	/
1365 x 768 60 Hz	/
1400 x 788 60 Hz	/
SXGA 60 Hz (1280 x 1024)	VESA Standard
SXGA 50 Hz (1280 x 1024)	VESA Standard
SXGA+ 60 Hz (1400 x 1050)	VESA Standard
SXGA+ 50 Hz (1400 x 1050)	VESA Standard
1080p 60 Hz (1920 x 1080)	SMPTE Standard
1080p 50 Hz (1920 x 1080)	SMPTE Standard
1080p 48 Hz (1920 x 1080)	SMPTE Standard
QXGA 60 Hz (2048 x 1536)	/
QXGA 50 Hz (2048 x 1536)	/
QXGA 48 Hz (2048 x 1536)	/

On entry to setup mode, the 24 x 2 LCD display indicates the following:

THEATERSYNC
Setup

Select the **Menu** key on your IR Remote to bring up the Setup Menu on the 24 x 2 LCD display. The LCD display will indicate the following:

“Parameter” = ???
Setup Mode

Using the Up and Down navigation keys on the remote, you can select the next parameter in a circular list of parameters. Using the Left and Right navigation keys on the remote, you can select the value of the parameter. In some cases, the parameter is visible in the setup menu, but may not be altered (such as Serial Number or MAC Address).

Selection of IP addresses is slightly different. IP addresses may only be selected if the DHCP parameter has been set to “Off”. In this case, you use the Left or Right navigation key to “enter” the IP address. The Left key will highlight the rightmost octet; the Right key will select the

leftmost octet. The Up/Down keys may then be used to increase/decrease the value of the octet. Subsequent presses of the Left/Right key will highlight the octet immediately to the left/right. The Up/Down keys may then be used to increase/decrease the value of the octet. When the leftmost/rightmost octet is selected, an additional Left/Right key selection will “exit” the IP address. The Up/Down arrows may then be used to select the next parameter. **Table 1** lists the Setup parameters.

5 On-Screen Menu











5.1 OSM Menu Structure

The On-Screen Menu (OSM) is the primary way of controlling and selecting functions in the TheaterSync system. When first powered up, the TheaterSync will be in a Factory Default configuration, with English as the OSM language, Component Video as Video Input, and S/PDIF Audio as Audio input. All other Factory Default parameters are indicated in **Table 4**. When the user selects the **Factory Reset** from the OSM menu, TheaterSync reloads all of these default parameters, replacing any adjustments previously made. Certain parameters are not affected by the **Factory Reset** and are left in their most recently selected position. These parameters are: Language, Selected Input, and Selected Audio Input. As indicated in **chapter 4**, the Setup Parameters are not affected by Factory Reset.

TheaterSync remembers all the signal processing parameters on a selected input basis. When the user powers down or selects a different input, the processing parameters previously selected are automatically re-established when returning to that input. An Input Reset sets the currently selected input to its default parameters. (This allows the user to reset a specific input channel without disturbing selections that affect the entire TheaterSync operation).

A complete view of the OSM menu structure is shown in **Table 3** and **Table 4**.

Table 3: OSM Main Menu Structure

Icon		Description	Functionality
ON	OFF		
		Inputs	Enter this submenu to select the video or audio input.
		Picture	Enter this menu to adjust the image brightness, contrast, sharpness, gamma correction, black level, color temperature, color, hue, tint, and aspect ratio.
		Setup	Enter this submenu to review the video system, select the background color, reset to default settings, and setup the menu position.
		Language	Enter this submenu to select the language used by the OSM.
		Info	Enter this submenu to view information about the system (input resolution, horizontal and vertical frequency, output resolution, horizontal and vertical frequency, firmware revision, FPGA revision, serial number, and IP address).



Icon		Description	Functionality
ON	OFF		
		Advanced	Enter this submenu to access the advanced menu options.

Table 4: OSM Complete Menu Structure

OSM Menu Level					Comments
Level 1	Level 2	Level 3	Level 4	Level 5	
Inputs	Video	Component	-	-	HDTV or SDTV
		VGA	-	-	SDTV, HDTV, or Graphics
		DVI	-	-	Graphics, RGB HDTV
		S-Video	-	-	SDTV
		Composite	-	-	SDTV
		SDI	-	-	SDI input selection
		HDMI	-	-	HDMI input selection
	Audio	TosLink	-	-	Selects TosLink as audio source
		S/PDIF	-	-	Selects S/PDIF as audio source
		Audio Delay	-100 - +100, 0 (default)	-	-
Picture	Picture Settings	Brightness	0 - 100, 50 (default)	-	The higher the setting, the greater the brightness. The lower the setting, the lower the brightness.
		Contrast	0 - 100, 50 (default)	-	The higher the setting, the greater the contrast. The lower the setting, the lower the contrast.

OSM Menu Level					Comments
Level 1	Level 2	Level 3	Level 4	Level 5	
Picture	Picture Settings	Sharpness	0 - 100, 50 (default)	-	The higher the setting, the sharper the image (edge enhancement). The lower the setting, the lower the sharpness.
		Detail Enhancement	0 - 100, 50 (default)	-	The higher the setting, the better the image (detail enhancement). The lower the setting, the lower the detail enhancement.
		Gamma Mode	Input Gamma	Gamma 1.0 (default)	Gamma LUT for linear response (1.0).
				Gamma 1.5	Gamma LUT for non-linear response (1.5).
				Gamma 2.2	Gamma LUT for non-linear response (2.2).
				Gamma 2.4	Gamma LUT for non-linear response (2.4).
				Gamma 2.5	Gamma LUT for non-linear response (2.5).
				Gamma 2.8	Gamma LUT for non-linear response (2.8).
			Output Gamma	Gamma 1.0 (default)	Gamma LUT for linear response (1.0).
				Gamma 2.2	Gamma LUT for non-linear response (2.2).
				Gamma 2.4	Gamma LUT for non-linear response (2.4).
				Gamma 2.5	Gamma LUT for non-linear response (2.5).
		Color Temp	9300K	-	Gives a blue tint to the white colors.
			6500K (default)	-	Gives a neutral tint to the white colors.
			5500K	-	Gives a red tint to the white colors.
Color	0 - 100, 50 (default)	-	The higher the setting, the greater the intensity. The lower the setting, the lower the intensity.		

OSM Menu Level					Comments
Level 1	Level 2	Level 3	Level 4	Level 5	
Picture	Picture Settings	Hue	0 - 360, 180 (default)	-	The higher the setting, the more greenish the picture. The lower the setting, the more purplish the picture.
		Input Reset	Confirm YES/NO	-	Returns all of the adjustments for a single input to the Factory Default state. All the other inputs and selections that affect the TheaterSync operation (such as Keystone Correction) are unaffected
	Aspect Ratio	Standard (default)	-	-	Maintains the aspect ratio: <ul style="list-style-type: none"> • 4:3 input and 16:9 output - Output image would be displayed with black pillar bars (maintains input aspect ratio) • 4:3 input and 4:3 output - No change • 16:9 input and 16:9 output - No change • 16:9 input and 4:3 output - Output image would be displayed with black letter box bars (maintains input aspect ratio)
		Full Screen	-	-	Fills the Output Screen by stretching the image (distorting the aspect ratio): <ul style="list-style-type: none"> • 4:3 input and 4:3 output – Grayed out, no action • 4:3 input and 16:9 output – Image is linearly stretched horizontally to fill the output screen • 16:9 input and 4:3 output - Image is linearly stretched vertically to fill the output screen • 16:9 input and 16:9 output – Grayed out, no action See section 5.2 for more information.
		Zoom	-	-	Fills the Output Screen by cropping the image (maintaining aspect ratio). <ul style="list-style-type: none"> • 4:3 input and 4:3 output – Grayed out, no action • 4:3 input and 16:9 output – Top and bottom portions of the image are cropped

OSM Menu Level					Comments
Level 1	Level 2	Level 3	Level 4	Level 5	
					<ul style="list-style-type: none"> 16:9 input and 4:3 output – Left and right portions of the image are cropped 16:9 input and 16:9 output – Grayed out, no action See section 5.2 for more information.
Picture	Aspect Ratio	Anamorphic	-	-	This mode is used with DVDs (Standard Definition) that are in Widescreen [16:9] format: <ul style="list-style-type: none"> 4:3 input and 4:3 output – The image is letter boxed 4:3 input and 16:9 output – The image appears full screen 16:9 input and 4:3 output – Grayed out, no action 16:9 input and 16:9 output – Grayed out, no action See section 5.2 for more information.
		Stadium	-	-	Fills the Output Screen by stretching the image (distorting the aspect ratio): <ul style="list-style-type: none"> 4:3 input and 4:3 output – Grayed out, no action 4:3 input and 16:9 output – Image is non-linearly stretched horizontally to fill the output screen 16:9 input and 4:3 output – Grayed out, no action 16:9 input and 16:9 output – Grayed out, no action See section 5.2 for more information.
	Picture Position	Vertical	0 - 100	-	Adjusts the vertical position of image (default setting depends on the input video/graphics source)
		Horizontal	0 - 400	-	Adjusts the horizontal position of image (default setting depends on the input video/graphics source)
	Autosync	-	-	-	Automatically centers the image for graphic inputs
Sync	Clock	0 - 200, 100 (default)	-	Adjusts clock sync	

OSM Menu Level					Comments
Level 1	Level 2	Level 3	Level 4	Level 5	
		Phase	0 - 100, 50 (default)	-	Adjusts clock phase
Picture	Overscan	Status	Off	-	-
			On	-	-
		Left	0.0 – 10.0 0.0 (default)	-	Sets the percentage of Overscan on the left edge
		Right	0.0 – 10.0 0.0 (default)	-	Sets the percentage of Overscan on the right edge
		Top	0.0 – 10.0 0.0 (default)	-	Sets the percentage of Overscan on the top edge
		Bottom	0.0 – 10.0 0.0 (default)	-	Sets the percentage of Overscan on the bottom edge
Setup	Menu Position	Center	-	-	Sets the OSM menu position in the center of the display
		Top Left	-	-	Sets the OSM menu position in the top left corner of the display
		Top Right	-	-	Sets the OSM menu position in the top right corner of the display
		Bottom Left	-	-	Sets the OSM menu position in the bottom left corner of the display
		Bottom Right	-	-	Sets the OSM menu position in the bottom right corner of the display
	Test Patterns	-	-	-	Displays test pattern images on screen, with OSM off. Up- and down-arrows navigate user through all 10 available test patterns. Left-arrow key returns user to Test Pattern menu.
	12 V Triggers	Trigger A	Off (default)	-	-
			On	-	-
	Trigger B	Off (default)	-	-	
		On	-	-	
	Factory Reset	Confirm YES/NO	-	-	Resets to default settings
Language	English	-	-	-	Selects the language for the OSM menus
	French	-	-	-	
	German	-	-	-	
	Italian	-	-	-	
	Spanish	-	-	-	

OSM Menu Level					Comments
Level 1	Level 2	Level 3	Level 4	Level 5	
	Portuguese	-	-	-	
Language	Swedish	-	-	-	Selects the language for the OSM menus
	Russian	-	-	-	
	Japanese	-	-	-	
	Chinese Simplified	-	-	-	
	Chinese Traditional	-	-	-	
	Korean	-	-	-	
Info	Input Resolution	-	-	-	Shows the source resolution
	Input H Frequency	-	-	-	Shows the source H frequency
	Input V Frequency	-	-	-	Shows the source V frequency
	Output Mode	-	-	-	Shows the display mode
	Output Resolution	-	-	-	Shows the display resolution
	Output H Frequency	-	-	-	Shows the display H frequency
	Output V Frequency	-	-	-	Shows the display V frequency
	Sync	-	-	-	Shows the synchronization type
	Firmware Revision	-	-	-	Shows the firmware revision number
	Serial Number	-	-	-	Shows the board serial number.
	IP Address	-	-	-	Shows the IP address only if the Ethernet cable is connected to the board and the IP address has been assigned by DHCP
	FPGA Revision	-	-	-	Shows the current revision number for the FPGA code
	Standby Micro Rev. #	-	-	-	Shows the firmware revision number for the standby-mode microcontroller
Advanced	Projection	Horizontal and Vertical Keystone	Top Left H	-	Controls the horizontal position of the display top left corner
			Top Left V	-	Controls the vertical position of the video display top left corner

OSM Menu Level					Comments
Level 1	Level 2	Level 3	Level 4	Level 5	
			Bottom Left H	-	Controls the horizontal position of the video display bottom left corner
Advanced	Projection	Horizontal and Vertical Keystone	Bottom Left V	-	Controls the vertical position of the video display bottom left corner
			Top Right H	-	Controls the horizontal position of the display top right corner
			Top Right V	-	Controls the vertical position of the display top right corner
			Bottom Right H	-	Controls the horizontal position of the video display bottom right corner
			Bottom Right V	-	Controls the vertical position of the video display bottom right corner
		Projection Mounting	Front Tabletop (default)	-	Normal projection mode
			Front Ceiling	-	Compensate the image for ceiling-mounting scenario
			Rear Tabletop	-	Compensate the image for projection from behind the screen
			Rear Ceiling	-	Compensate the image for ceiling-mounted rear-projection scenario
		Video Processing Mode	HQV On (default)	-	-
	HQV Off (Bypass)		-	-	Process main image in Overlay Scaler (bypass the TVP processor)
	HQV Film Mode	Auto (default)	-	-	The system automatically selects the best mode for de-interlacing (film or video)
		Video	-	-	Forces to video mode for de-interlacing
		Film	-	-	Forces to film mode for de-interlacing
	BCE	Video ²	-	-	Expands video range signals (16-235) linearly to full range output
		Cinema	-	-	Provides Luma processing optimized for movies; expands video range signals.

² Default for HDMI, Component, Composite, S-Video, and SDI inputs.

OSM Menu Level					Comments	
Level 1	Level 2	Level 3	Level 4	Level 5		
		Vivid	-	-	Enhances color, expands video range signals.	
		Dark Scene	-	-	Enhances detail in dark scenes, expands video range signals.	
Advanced	BCE	Bright Scene	-	-	Enhances detail in bright scenes, expands video range signals.	
		Graphics ³	-	-	Transfers full range input signals (0-255) to full range output	
	HQV Noise Reduction	TRNR	Off	-	-	Turns off Temporal Recursive Noise Reduction (TRNR)
			Low (default)	-	-	Select TRNR -- low bias setting
			Med	-	-	Select TRNR -- medium bias setting
			High	-	-	Select TRNR -- high bias setting
		CNR	Off (default)	-	-	Turns off the Codec Noise Reduction
			Low	-	-	Select Codec Noise Reduction, low level
			Medium	-	-	Select Codec Noise Reduction, medium level
			High	-	-	Select Codec Noise Reduction, high level
	Split	Off (default)	-	-	Toggles the split screen mode	
		On	-	-	Toggles the split screen mode	

5.2 Aspect Ratio

TheaterSync provides five different aspect ratio treatments. The operation mode of these treatments depends on the aspect ratio of the input channel and the output display.

The TheaterSync assumes that the aspect ratio of input and output is consistent with the industry standard definition of the aspect ratio of the particular input signal and video mode. Output aspect ratio is thus determined by the resolution selected by the user in Setup Mode. Input aspect ratio is determined by the TheaterSync video mode recognition circuitry. Only two output aspect ratios are supported, 4:3 and 16:9⁴.

³ Default for DVI and Analog RGB inputs.

⁴ The special case of 1280 x 1024 SXGA (an aspect ratio of 5:4) on output is treated as if it were 4:3. The output of a 1280 x 1024 display will be slightly distorted; circles will appear to be vertically oriented ovals. Since the

Inputs considered to have 4:3 aspect ratio are:

- Computer Graphics signals with a 4:3 aspect ratio appearing on the DVI and Analog RGB inputs
- SDTV signals (NTSC and PAL derived) appearing on the Composite, S-Video, and Component inputs
- SDTV signals (NTSC and PAL derived) appearing on the SDI input
- SDTV signals (NTSC and PAL derived) appearing on the HDMI input

Inputs considered to have 16:9 aspect ratio are:

- Computer Graphics signals with a 16:9 aspect ratio appearing on the DVI and Analog RGB inputs
- HDTV signals (480p, 720p, 1080i, 1080p) appearing on the Component input
- HDTV signals (480p, 720p, 1080i, 1080p) appearing on the SDI input
- HDTV signals (480p, 720p, 1080i, 1080p) appearing on the HDMI input

The five aspect ratio treatments, Standard, Full Screen, Zoom, Anamorphic, and Stadium are intended to achieve different aspect ratio objectives, and therefore behave differently depending on which input and output aspect ratios are currently selected. The Aspect Ratio objectives are the following:

- Standard: always displays the correct aspect ratio of the input picture; adds black bars at the top and bottom or sides of the picture to achieve this objective
- Full Screen: always fills the screen with the complete picture; linearly distorts the picture to achieve this objective
- Zoom: always fills the screen with the correct aspect ratio of the input picture; crops the picture's top and bottom or sides to achieve this objective
- Anamorphic: intended to handle the specific case of 16:9 aspect ratio anamorphically encoded into a 4:3 aspect ratio signal (e. g. an NTSC DVD encoded with a 16:9 picture)
- Stadium: intended to handle the specific case of a 4:3 input aspect ratio and 16:9 output aspect ratio

Table 5 to **Table 8** present the five aspect ratio treatments over the four different combinations of Input Aspect Ratio and Output Aspect Ratio.

TheaterSync is intended for Widescreen processing, the 1280 x 1024 SXGA is not a frequently encountered case. Input of 1280 x 1024 will be treated as a pillar boxed 4:3 signal (i.e. it will have narrow black bars on the Right and Left); aspect ratio of the picture content will be undistorted.

Table 5: Aspect Ratio Treatments for 4:3 Input with 4:3 Output

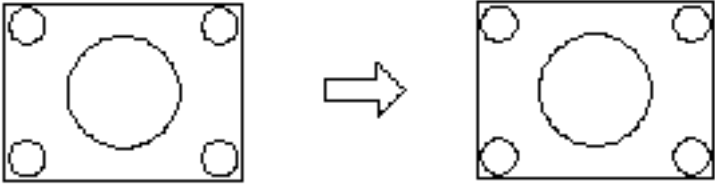
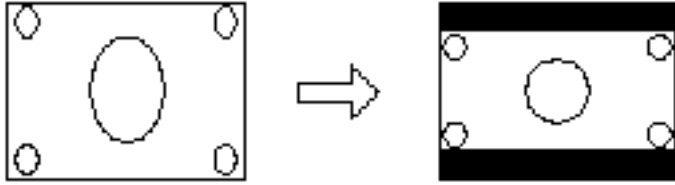

OSM Menu Name	Description
Standard	4:3 input signals shown full screen on 4:3 output display 
Full Screen	Grayed out. No action.
Zoom	Same as "Standard" mode above.
Anamorphic	Anamorphic or widescreen encoded DVDs shown letterbox on 4:3 output display. These DVDs have 16:9 content that has been compressed and expanded vertically to fit the NTSC or PAL signal. 
Stadium	Grayed out. No action.

Table 6: Aspect Ratio Treatments for 4:3 Input with 16:9 Output

OSM Menu Name	Description
Standard	4:3 input signals are shown in a pillar box on the 16:9 output display 
Full Screen	4:3 input is linearly stretched horizontally to fill the 16:9 screen

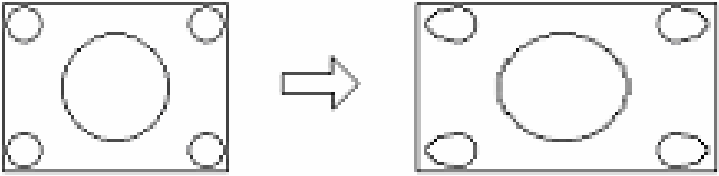
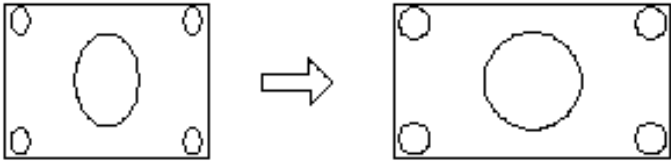
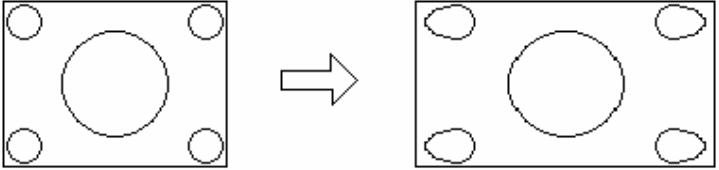
OSM Menu Name	Description
	
Zoom	Grayed out. No action.
Anamorphic	<p>SDTV input is displayed on a full screen 16:9 output display</p> 
Stadium	<p>4:3 input signals are non-linearly stretched in the horizontal direction to fill 16:9 output displays. Horizontal and vertical scaling is equal in the middle, more horizontal stretching towards left and right sides to fill 16:9 outputs</p> 

Table 7: Aspect Ratio Treatments for 16:9 Input with 4:3 Output

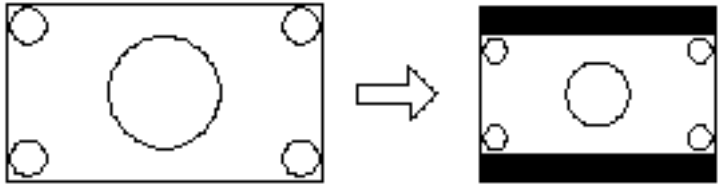
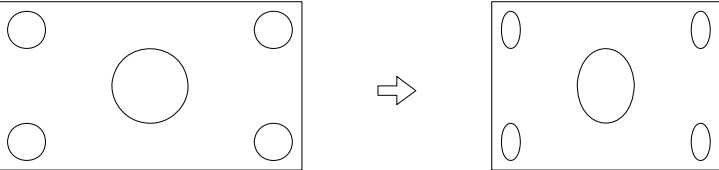
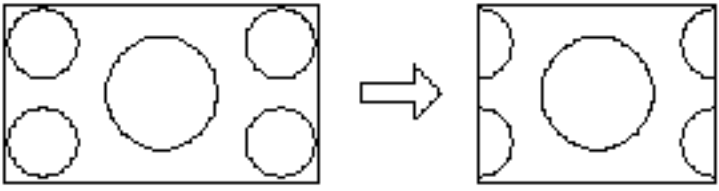
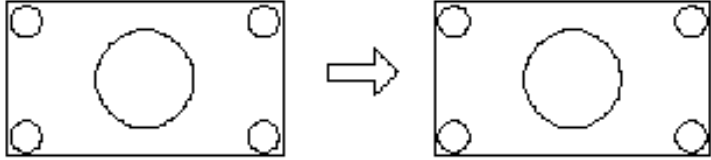
OSM Menu Name	Description
Standard	<p>All HDTV inputs are assumed to be 16:9. HDTV input signals (1080i and 720p) are shown in a letterbox on the 4:3 output display</p> 
Full Screen	<p>Image stretched vertically to fill full screen.</p> 
Zoom	<p>16:9 HDTV input signals shown in 4:3 output display, cropped on left and right sides</p> 
Anamorphic	<p>Grayed out. No action.</p>
Stadium	<p>Grayed out. No action.</p>

Table 8: Aspect Ratio Treatments for 16:9 Input with 16:9 Output

OSM Menu Name	Description
Standard	16:9 input signals shown full screen on 16:9 output display 
Full Screen	Grayed out. No action.
Zoom	Grayed out. No action.
Anamorphic	Grayed out. No action.
Stadium	Grayed out. No action.

6 Appendix A

Table 9: Input Modes Supported

Item No.	Input Timing Format			Input Video Source						
	Mode Description	Resolution	Frequency	RGB	DVI	HDMI	Composite	S-video	Component	SDI
1	480i (NTSC)	720 x 485	60 Hz	-	-	YES	YES	YES	YES	YES
2	576i (PAL)	720 x 576	50 HZ	-	-	-	YES	YES	YES	YES
3	576i (SECAM)	720 x 576	50 Hz	-	-	-	YES	YES	-	-
4	480p	720 x 483	60 Hz	-	YES	YES	-	-	YES	-
5	576p	720 x 576	50 Hz	-	YES	YES	-	-	YES	-
6	HDTV 720 Progressive	1280 x 720	60 Hz	-	YES	YES	-	-	YES	YES
7	HDTV 720 50 Hz Progressive	1280 x 720	50 Hz	-	YES	YES	-	-	YES	-
8	HDTV 1080 Interlaced at 60 Hz	1920 x 1080	60 Hz	-	YES	YES	-	-	YES	YES
9	HDTV 1080 Interlaced at 50 Hz	1920 x 1080	50 Hz	-	YES	YES	-	-	YES	YES
10	1080p at 24 Hz	1920 x 1080	24 Hz	-	-	-	-	-	-	YES
11	1080p at 25 Hz	1920 x 1080	25 Hz	-	-	-	-	-	-	YES
12	1080p at 30 Hz	1920 x 1080	30 Hz	-	-	-	-	-	-	YES
13	1080p at 24sF	1920 x 1080	48 Hz	-	-	-	-	-	-	YES
14	1080p at 25sF	1920 x 1080	50 Hz	-	-	-	-	-	-	YES
15	1080p at 30sF	1920 x 1080	60 Hz	-	-	-	-	-	-	YES
16	DOS TEXT	640 x 400	70 Hz	YES	YES	YES	-	-	-	-

Item No.	Input Timing Format			Input Video Source						
	Mode Description	Resolution	Frequency	RGB	DVI	HDMI	Composite	S-video	Component	SDI
17	VGA at 60 Hz	640 x 480	60 Hz	YES	YES	YES	-	-	-	-
18	SVGA at 75 Hz	800 x 600	75 Hz	YES	YES	YES	-	-	-	-
19	848 x 480	848 x 840	60 Hz	YES	YES	-	-	-	-	-
20	1024 x 576	1024 x 576	60 Hz	YES	YES	-	-	-	-	-
21	XGA at 75 Hz	1024 x 768	75 Hz	YES	YES	YES	-	-	-	-
22	SXGA at 75 Hz	1280 x 1024	76 Hz	YES	YES	YES	-	-	-	-
23	1360 x 768	1360 x 768	60 Hz	YES	YES	-	-	-	-	-
24	1365 x 768	1365 x 768	60 Hz	YES	YES	-	-	-	-	-
25	SXGA+	1400 x 1050	60 Hz	YES	YES	-	-	-	-	-
26	UXGA	1600 x 1200	60 Hz	-	YES	YES	-	-	-	-
27	WUXGA	1920 x 1200	60 Hz	-	YES	-	-	-	-	-
28	QXGA	2048 x 1536	60 Hz	-	YES	-	-	-	-	-
29	MAC II Normal 13in	640 x 480	67 Hz	YES	YES	YES	-	-	-	-
30	MAC II Normal 16in	832 x 624	75 Hz	YES	YES	-	-	-	-	-
31	MAC II Normal 19in	1024 x 768	75 Hz	YES	YES	-	-	-	-	-
32	MAC II Normal 21in	1152 x 870	75 Hz	YES	YES	YES	-	-	-	-
33	MAC	1440 x 960	96 Hz	-	YES	-	-	-	-	-
34	MAC 20	1680 x 1050	88 Hz	-	YES	-	-	-	-	-
35	MAC 23	1920 x 1200	76 Hz	-	YES	-	-	-	-	-

